

BIOLOGICAL ASSESSMENT FOR THE USE OF BED-LEVELING DEVICES IN PORT CANAVERAL – BASELINE RESEARCH AND DATA COMPILATION

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ABSTRACT

In response to previous findings by the National Marine Fisheries Service (NMFS) in Biological Opinions issued under the Endangered Species Act (ESA), the USACE-Jacksonville District initiated a review of the use of bed-leveling devices within several Florida ports. The question of bed-leveler use and its potential impact on sea turtles was raised during a USACE-permitted bed-leveling project in Brunswick Harbor when the Georgia Department of Natural Resources reported to the Savannah District that six sea turtles with odd, traumatic injuries were found stranded along the Georgia coast at about the same time a dredging contractor was employing a bed-leveling device. The purpose of this project was to research, collect, and compile baseline information regarding the use of bed-leveling devices and the potential effects on sea turtles during hopper dredging operations in Florida's ports. Information on dredging events was cross-referenced with sea turtle take and stranding location data to identify potential correlations with dredge events and sea turtle mortality. Information and data were compiled from several sources, including USACE dredging history reports, interviews with dredging industry professionals, USACE Sea Turtle Warehouse website, and the Sea Turtle Stranding and Salvage Network (STSSN) database.

The USACE Sea Turtle Warehouse website houses data regarding sea turtle mortality (takes) directly attributable to dredging operations occurring during hopper dredging projects. The STSSN database documents dead or injured sea turtles along the coasts of the United States. The number of sea turtle strandings and takes occurring during specified dredging timeframes was determined using these two database resources. Data were mapped and developed into graphics using ArcView GIS to depict the number of sea turtle strandings that occurred in the proximity of port entrance channels during specific dredging events. This information was used to prepare a Biological Assessment (BA) for each port (Port Canaveral, Port of Palm Beach, Port Everglades, and Port of Miami) evaluating the potential effects to sea turtles and initiate consultation under ESA.

Keywords: Sea turtles, Endangered Species Act, hopper dredging, strandings, biological opinion

INTRODUCTION

A “bed-leveler” is a large customized plow, I-beam, or old spud that is used by dredge contractors following new work and maintenance dredging primarily to level out ridges and trenches created by dredging equipment or to reduce excessively high dredged material disposal mounds. In certain cases bed-levelers are used to redistribute sediments to maintain navigable depths rather than removing them by conventional dredging methods. Bed-levelers are suspended from work barges by winches on A-frames to control the operating depth of the device (Figures 1 and 2). A 750- to 2,250-kilowatt tug is generally used to push or pull the barge-mounted bed-leveler at towing speeds ranging from 1.85 to 3.70 kilometers (km) per hour. A typical bed-leveler varies from 9 to 14 meters (m) in width and weighs between 25 to 50 metric tons. Dredge types using bed-levelers include clamshell (excavator), bucket, hydraulic cutterhead, and hopper dredges. According to dredge contractors, bed-leveling is the preferred and least-expensive method for achieving the final grade (ERDC 2003).

Although bed-leveling is not a new dredging technique, the use of bed-levelers by dredge contractors in U.S. waters is not well documented. Bed-leveling was mentioned in passing in some of the early (1984-1987) Canaveral

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observer reports but has not been an issue of concern until recently. The question of bed-leveler use and its potential impact on sea turtles was raised during a USACE-permitted bed-leveling project in Brunswick Harbor when the Georgia Department of Natural Resources reported to the Savannah District that six sea turtles with odd, traumatic injuries were found stranded along the Georgia coast at about the same time a dredging contractor was employing a bed-leveling device (NMFS 2003a). The stranded turtles had crushing-type injuries that did not appear to be consistent with those produced by hopper dredges (Table 1). Although no conclusive evidence was found to link the bed-leveler with any of the reported sea turtle strandings, it raises the possibility that operating a bed-leveler may, under certain conditions, result in takes of sea turtles (NMFS 2003a). The concern is that brumating (burying themselves in the bottom mud), resting, or foraging sea turtles may be crushed as the leveling device passes over a turtle that fails to move out of the way or is not pushed out of the way by the sediment wedge “wave” which is generated by and moves ahead of the device (NMFS 2003b). Sea turtles have been found brumating in North Carolina waters and in the Canaveral Channel during winter months (Sheryan Epperly, personal communication; NMFS 2003).

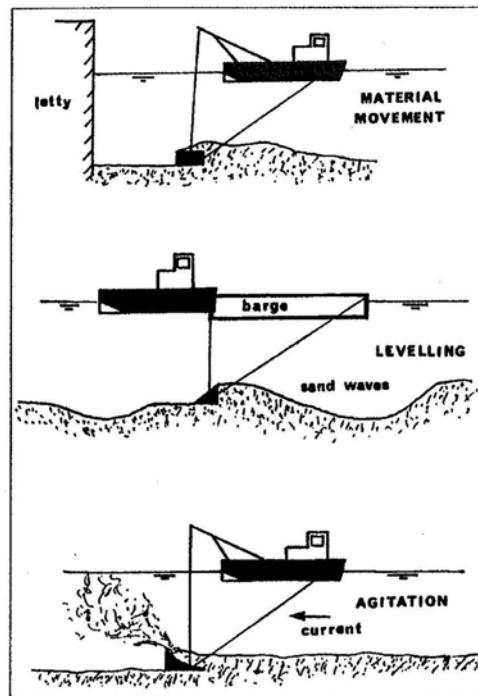


Figure 1. Drag-beam devices used for material movement, bed-leveling, and agitation dredging.
(after Mohammed 1994)



Figure 2. Example of a bed-leveler suspended from work-barge.
(photo courtesy of Weeks Marine Incorporated)

Table 1. Description of turtle stranding injuries during the Brunswick Harbor Deepening Project, Brunswick, GA*.

Date	Location	Species	Injury
03-29-03	Brunswick Ship Channel	Kemp's Ridley	Crushed skull
04-04-03	Jekyll Island	Loggerhead	Crushed/scraped skull
04-25-03	St. Simons Island	Loggerhead	Head, right front flipper and piece of plastron
04-28-03	Jekyll Island	Loggerhead	Front half of carapace only
05-06-03	Jekyll Island	Kemp's Ridley	Front half of carapace only
05-09-03	St. Simons Island	Loggerhead	Crushed, but badly decomposed

*This information was excerpted from the 2004 *Study on Bed-Leveler Use in Brunswick Harbor Deepening Project, Brunswick, GA*

Before the 2003 Brunswick Harbor project, resource agencies were apparently unaware of the routine use of bed-levelers during dredging activities, particularly in the cleanup phase because bed-levelers were not considered a specific pay item and were not included in the plant and equipment lists of contractors' bids (Hales et al. 2005; NMFS 2003a). In addition, contract language and dredging companies' daily operation logs typically did not document specific dates and corresponding locations where this technique was used (Hales et al. 2005). There are no restrictions on bed-leveler use in Florida or within the boundaries of the Jacksonville District; therefore, the District is not required to document that its use is in compliance with any environmental laws or regulations (ERDC 2003). This lack of documentation makes it difficult to assess what effect, if any, bed-leveler use may have on sea turtles. However, it has been determined that bed-leveling has been used periodically (not frequently) during dredging projects throughout the sea turtle's range in the U.S. (Dickerson and Clausner 2003). This constitutes new information not considered in consultations with the South Atlantic Division (SAD), including the 1997 South Atlantic Regional Biological Opinion concerning hopper dredging. Districts within SAD had not previously assessed potential effects of bed-leveler use on sea turtles and acknowledged that this information would be difficult to obtain (Hales et al. 2005).

In November 2003, NMFS did issue a Gulf Regional Biological Opinion to the USACE's Gulf of Mexico Districts (including the Jacksonville District) stating that although bed-levelers were suspected of having the potential to take turtles, the use of bed-levelers for cleanup operations is probably preferable to the use of hopper dredges. NMFS reasoned that turtles that are foraging/resting/brumating on irregular bottoms are probably more likely to be entrained by suction dragheads because (1) sea turtle deflectors on hopper dredge suction dragheads are less effective on uneven bottoms at deflecting sea turtles away from the suction dragheads, (2) hopper dredges operate considerably faster than bed-leveler dredges (9.2 km per hour vs. 3.7 km per hour), and (3) bed-levelers do not use suction (NMFS 2003b).

In response to findings by NMFS, the USACE-Jacksonville District initiated a review of the use of bed-leveling devices within four Florida ports (Port Canaveral, Port of Palm Beach, Port Everglades, and Port of Miami) to research, collect, and compile baseline information regarding the use of bed-leveling devices and their potential effects on sea turtles during hopper dredging operations in Florida's ports. Information on dredging events was cross-referenced with sea turtle take and stranding location data to identify potential correlations with dredge events and sea turtle mortality. A *turtle take* is defined as a turtle that has been entrained and injured or killed by a hopper dredge. A *turtle stranding* is defined as a turtle that has been found either washed up on the beach or floating in the water. Information and data were compiled from several sources, including USACE dredging history reports, interviews with dredging industry professionals, the USACE Sea Turtle Warehouse website, and the Florida Fish and Wildlife Conservation Commission (FWCC) STSSN database. Based on this information, a BA was prepared for each port to evaluate the potential effects of bed-leveling on sea turtles and to initiate consultation under ESA. This paper summarizes the results and conclusions of the use of bed-leveling devices in the major channels and basins within Port Canaveral.

Canaveral Harbor, a man-made harbor facility, is on the Atlantic coast of Central Florida along the southern portion of the Cape Canaveral Peninsula in Brevard County (Figure 3). The navigation channel at Canaveral Harbor serves Port Canaveral, the U. S. Air Force, and the U. S. Navy Trident Submarine Facility. The entrance channel is constructed through a barrier island that separates the Atlantic Ocean from the Banana River. Port Canaveral is a major deepwater port of entry with berthing facilities, a marine commercial park, and a foreign trade zone. It was constructed on filled coastal uplands and wetlands between the Atlantic Ocean and the Banana River. Average

dredged depths range from 8 to 13 m through the main channel and basins and from 3 to 5 m in the primarily privately used southwestern corner. Port Canaveral serves all of Central Florida from its coastal location in Brevard County and is the closest deepwater port to the nearby Orlando-area attractions and neighboring Cape Canaveral Air Force Station, Patrick Air Force Base, Kennedy Space Center, and Cocoa Beach.

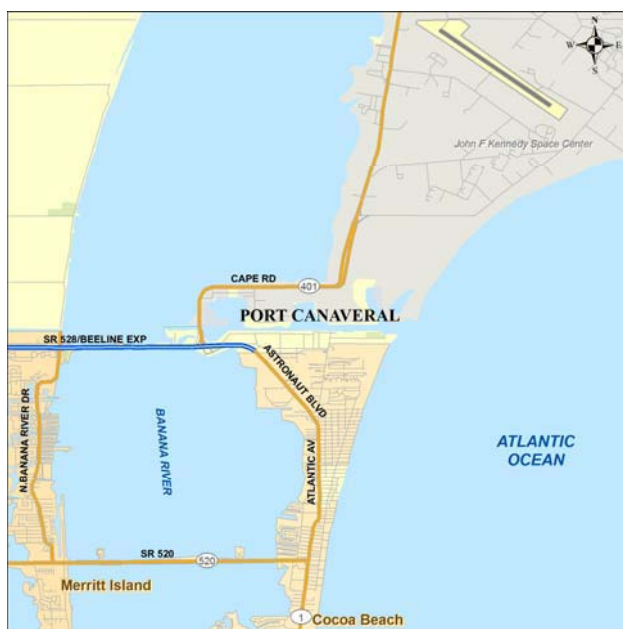


Figure 3. Canaveral Harbor, Brevard County, Florida.

METHODS

Dredging Documentation, Sea Turtle Takes, and Sea Turtle Strandings

Dredging history reports for projects conducted between 1990 and 2005 within Port Canaveral were provided by USACE-Jacksonville District. The authors reviewed the reports to determine if information about the use of bed-leveling devices was included in the documentation and to determine how much bucket and hopper dredging was conducted within that 15-year period.

Data regarding sea turtle takes (injury or mortality) directly attributable to hopper dredging operations were compiled from the USACE Sea Turtle Warehouse website. This internet-based database was created to centralize and archive historical and future data regarding sea turtle impacts from hopper dredging activities for long-term continuity and evaluation of these data.

A sea turtle stranding search was conducted using the STSSN database. This database documents dead or injured sea turtles along the coasts of the eastern United States (Schroeder 1989). Trained volunteers collect information on stranded sea turtles, including species identification; coordinates of stranding location; the condition or state of decomposition; standard carapace measurements; and a description of any obvious wounds, injuries, or abnormalities. This information is recorded on standardized report forms that are submitted to a state coordinator (for strandings in Florida, this data is housed at the FFWCC) and then to the national STSSN coordinator at NMFS, Southeast Fisheries Science Center, Miami, Florida.

The sea turtle stranding reports of interest for this project include those involving impact- or crushing- (non-propeller) type injuries coinciding with dredging project timeframes (i.e., during each dredging project and within two weeks after a dredging project had been completed) and occurring within a 6.4-km (4-mile) radius of the Port Canaveral entrance channel. The two week time period was established to ensure that if a turtle had been killed by bed-leveling activities and the carcass sank to the bottom, that based on the existing knowledge concerning decomposition rates of sea turtles, enough time would pass to allow gases formed during decomposition to collect

inside the carcass to allow it to float and then wash ashore. The STSSN database was sorted in several steps to obtain the reports of interest. FFWCC provided an initial database file that included all sea turtle strandings occurring in Brevard County between 1990 and 2005 that involved non-propeller type injuries. These data were converted to GIS format (ArcView shapefile) and clipped geographically to include only those strandings occurring within the designated 6.4-km (4-mile) radius of the entrance channel. Using this information, the number of sea turtle strandings occurring during the specified dredging timeframes was determined. For comparison purposes, the number of sea turtle strandings occurring outside the dredging timeframes but within the 6.4-km (4-mile) radius was also determined. These data were mapped and developed into graphics using ArcView GIS to depict the number of sea turtle strandings that occurred between 1990 and 2005 and their proximity to the Port Canaveral entrance channel.

Interviews with Dredging Professionals and USACE SAD District

In May 2003 and February 2005, the USACE Engineer Research and Development Center (ERDC) distributed questionnaires to Charleston, Wilmington, Savannah, Jacksonville, and Mobile District personnel and selected dredging industry contractors (Bean Dredging Corporation, New Orleans, LA; Great Lakes Dredge and Dock Company (GLDD), Oak Brook, IL; Manson Construction Company, Seattle, WA; Weeks Marine Incorporated, Kenner, LA) seeking information about bed-leveler use during USACE dredging projects. These four contractors represent the predominant hopper dredging capability in the United States. The data compiled include information regarding the variety of bed-leveling devices currently used by the industry and how the devices are used. Additional information collected includes drawings, schematics, and photos of these devices. ERDC (2003) and Hales et al. (2005) summarize composite findings of the industry survey and USACE SAD District survey.

To supplement information from the USACE ERDC survey and to gather specific information regarding the extent of bed-leveler use in Canaveral Harbor, additional interviews were conducted with dredging professionals at companies that performed dredging operations in Port Canaveral between 1990 and 2005. The additional companies contacted were Southern Dredging Company, NATCO Limited Partnership, Norfolk Dredging Company, and Dutra Construction Company. The Area Engineer for USACE, Jacksonville District was also contacted to see if any journals or logs exist that may contain information or notes regarding dredging activities and equipment used during dredging projects.

RESULTS

Dredging Documentation, Sea Turtle Takes, and Sea Turtle Strandings

The Canaveral Harbor entrance channel is unique because it is historically the most densely populated area of sea turtle activity in the country (Bargo 2004). Hopper dredging has not been allowed in Canaveral Harbor since 1992, except during temporary emergency exemptions, because of the high numbers of sea turtles present year round and the potential for an unacceptable number of takes. In 1997, NMFS issued a Regional Biological Opinion governing hopper dredging along the southeastern United States that also imposed a continuous restriction on hopper dredging in Canaveral Harbor due to the high abundance of sea turtles in the area. Since then, almost all of the dredging of this channel has been accomplished, at a substantial increase in cost, by mechanical or cutterhead dredging with no documented sea turtle takes (Dickerson et al. 2004).

Table 2 summarizes information compiled from dredging history reports, turtle take reports, and turtle stranding reports for turtles with impact- or crushing- (non-propeller) type injuries for dredging projects conducted within Canaveral Harbor from 1990 to 2005. Since 1990, 18 dredging projects were conducted in the Canaveral Harbor entrance channel and turning basins. Out of the 18 dredging projects, five involved hopper dredges and the remainder primarily involved mechanical clamshell dredges. The amount of material dredged per project ranged from 5,240 to 1,519,000 cubic meters (m³). Although bed-leveling was mentioned in passing in some of the early (1984-1987) Canaveral observer reports, none of the dredging history reports associated with dredging projects conducted from 1990 to 2005 provided information regarding the use of bed-leveling devices.

Between 1990 and 2005, sea turtle takes were reported by observers during three of the five hopper dredging projects resulting in a total of 13 takes (nine greens, four loggerheads). Two of the hopper dredging projects

occurred after the 1997 RBO was issued. According to the dredging history reports, both projects involved emergency maintenance dredging.

Table 2. Summary of dredging projects conducted between 1990 and 2005 in Canaveral Harbor, Brevard County, Florida.

Dredging Dates	Contractor	Dredge Type	Total Pay Volume (cy)	Total Pay Volume (m ³)	Bed-leveler Used?	Sea Turtle Takes [^]	Sea Turtle Strandings [^]
06/22/90 – 08/03/90	Southern Dredging Co.	Unknown	290,333	221,814	Unknown	0	0
10/10/90 – 02/26/91	NATCO	Hopper	173,772	132,762	Unknown	4G, 4L	0
09/01/91 – 11/01/91	Norfolk Dredging Co.	Clamshell	465,000	355,260	Unknown	0	0
05/19/92 – 10/17/92	Norfolk Dredging Co.	Clamshell	621,433	474,775	Unknown	0	1L
07/03/93 – 12/08/93	Weeks Marine, Inc.	Clamshell	1,986,870	1,517,969	Unknown	0	0
10/14/94 – 11/09/94	Dutra Construction Co.	Closed Bucket	81,970	62,625	Unknown	0	0
10/14/94 – 11/09/94	Dutra Construction Co.	Clamshell	1,300,100	993,276	Unknown	0	0
09/15/94 – 09/30/94	U.S. Government	Hopper	52,680	40,248	No	1G	1K
08/04/95 – 11/17/95	Norfolk Dredging Co.	Clamshell	692,781	529,285	Unknown	0	0
11/18/95 – 01/12/96	Norfolk Dredging Co.	Clamshell	6,854	5,236	Unknown	0	0
07/02/96 – 07/30/96	U.S. Government	Hopper	245,274	187,389	No	0	1L
02/09/97 – 05/23/97	Weeks Marine, Inc.	Clamshell	810,964	619,576	Unknown	0	0
02/21/98 – 06/04/98	Bean Horizon Corp.	Cutter/suction	0	0	Unknown	0	6L, 1G [#]
04/20/98 – 01/30/99	Weeks Marine, Inc.	Clamshell	848,883	648,547	Unknown	0	
06/15/99 – 12/15/99	Weeks Marine, Inc.	Clamshell	1,312,703	1,002,905	Unknown	0	5L
08/24/00 – 10/03/00	GLDD	Clamshell	253,115	193,380	Unknown	0	0
02/21/02 – 02/24/02	GLDD	Hopper	26,833	20,500	Unknown	0	0
06/16/04 – 10/19/04	Norfolk Dredging	Clamshell	0	0	Unknown	0	1L
09/12/04 – 10/06/04	GLDD	Hopper	197,730	151,066	Unknown	4G	0

[^] G = Green Sea Turtle, L = Loggerhead Sea Turtle; [#] = Concurrent dredging projects involving seven strandings

The February 2002 emergency maintenance dredging project involving a hopper dredge was requested by the U.S. Navy to remove a small, but significant shoal located in Cut 2 of the Canaveral Harbor entrance channel. The Navy determined that this shoal would hamper its mission and requested a one-time emergency exemption from the terms and conditions of the 1997 Regional Biological Opinion in order to use a hopper dredge to dredge the Canaveral Harbor entrance channel to allow safe passage of a naval submarine. After consultation between NMFS and USACE, relocation trawling was recommended in an effort to remove sea turtles from the area. As a result, a 24-hour-per-day sea turtle pre-dredge and relocation trawling project was initiated in the Port Canaveral Harbor from February 18-24, 2002. Sixty-nine sea turtles were successfully caught, tagged, and released approximately 4.8 km from shore with no recapture reported (Bargo and Parks 2002). No takes occurred during this dredging project.

Between September and October 2004, an emergency maintenance dredging project involving a hopper dredge was conducted in the Canaveral Harbor entrance channel after Hurricanes Charley, Francis, Ivan, and Jeanne caused significant shoaling. Port Canaveral, a popular cruise ship destination, was unable to continue routine operations as a result of the shoaling. Sea turtle relocation trawling was initiated at Level 6 (200% coverage) by the USACE-Jacksonville District and was conducted concurrent to the emergency dredging (Bargo 2004). Relocation trawling was conducted from September 12 through October 6, 2004. A total of 124 sea turtles with four recaptures were caught, tagged, and safely released 5 to 8 km east-southeast of the project area (90 loggerheads, 30 green) (Bargo 2004). Four takes were associated with this project: three dredge-related and one trawler-related (Bargo 2004). The number of sea turtles relocated during these two projects demonstrates the abundance of sea turtles in the vicinity of the Canaveral Harbor entrance channel.

In addition to the four sea turtle takes associated with the 2004 emergency maintenance dredging project, two other projects involving hopper dredges have reported sea turtle takes. During October 1990 to February 1991, the hopper dredge named *Sugar Island* owned by NATCO Limited Partnership reported four green and four loggerhead sea

turtle takes. In September 1994, the U.S. Government hopper dredge named *McFarland* reported one green sea turtle take.

According to the STSSN database, between 1990 and 2005 a total of 54 turtle strandings exhibited crushing- or impact-type injuries within the designated 4-mile radius of the Canaveral Harbor entrance channel. Of these 54 strandings, 16 either occurred during a dredging project or within 2 weeks after a dredging project had been completed (Figure 4). These 16 strandings (1 green, 1 Kemp's Ridley, and 14 loggerheads) coincided with seven dredging projects over the 15-year period.

The number of turtle strandings occurring over the 15-year period was also graphed by month. The data indicate that whether or not dredging activities were being conducted within the harbor, strandings occurred more frequently in the spring and summer months (Figure 5). This may be because turtle nesting season occurs during spring and summer, which increases the concentration of sea turtles in the area. It is also important to emphasize that while strandings may have occurred during the time evaluated for a dredging project, there is no conclusive information to link the strandings to the dredging operations.



Figure 4. 1990-2005 sea turtle strandings by contractor and dredge type, Port Canaveral, Brevard County, Florida.

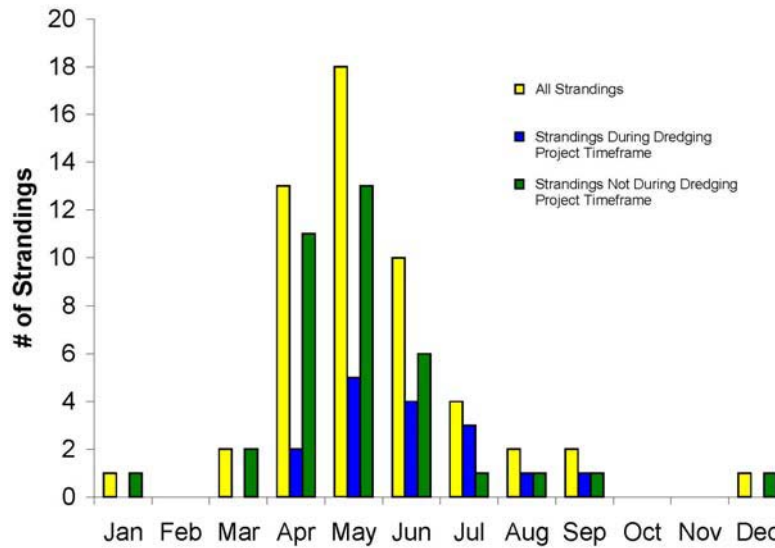


Figure 5. Monthly turtle strandings with non-propeller-type injuries occurring within a 6.4-km (4-mile) radius of the Canaveral Harbor Entrance Channel between 1990 and 2005.

Industry and USACE SAD Survey

Seven dredging contractors have conducted dredging within Canaveral Harbor between 1990 and 2005: Southern Dredging Company, NATCO (North American Trailing Company) Limited Partnership, Norfolk Dredging Company, Dutra Construction, Weeks Marine Incorporated, Bean Horizon Corporation, and Great Lakes Dredge and Dock Company (GLDD). In 2003 and 2005, USACE ERDC surveyed GLDD, Weeks Marine Incorporated, and Bean Horizon Corporation. ERDC (2003) and Hales et al. (2003) composite findings of the industry survey and results are summarized below.

According to the dredge contractors interviewed, bed-levelers are used most often in soft sediments such as silts and clays and less frequently in sandy sediments that typically occur in bar entrance channels. Bed-leveling devices are routinely used following new work and maintenance dredging performed by conventional dredging methods (i.e., clamshell, bucket, hydraulic cutterhead, and hopper dredges) to relocate sediment from high spots into adjacent low areas. A hopper dredge draghead, especially one equipped with a Turtle Excluder Device (TED) – also called a rigid turtle deflector, will tend to fall off ridges, dig deep, and follow the same path with successive passes. This tends to dredge trenches and leave ridges. Clamshell and bucket dredges typically leave high spots between lifts. If the contractor is required to bring the high spots down to desired grade, bed-leveling is a far more efficient and cost-effective method for lowering these high spots than using conventional dredging methods. Bed-leveling operations can also efficiently locate target areas in tandem with multi-beam precision bathymetry survey systems.

Within the dredging industry, the H-beam method of bed-leveling is typically used following cutterhead or excavator dredge operations. Drag bar bed-leveling is used following hopper dredging operations. The H-beam method was used by Bean Stuyvesant in Houston, Texas in 2003 and 2004 and in New York Harbor from 2000 to present with no impact on endangered species (R.E. Courtright 2005, personal correspondence). Both projects used an excavator dredge.

The results of the USACE SAD survey concluded that bed-levelers are used to a limited extent in the Jacksonville District because much of the hopper dredging is performed in entrance channels with sandy materials and wave activity that smoothes the bottom and eradicates any ridges left by the dredge. However, bed-levelers have been used effectively in Canaveral Harbor where bucket dredges operate and in areas of stiff materials. All bed-leveling in Canaveral Harbor has been associated with mechanical dredging, not hopper dredging, and bed-leveling has not been performed following dredging by the U.S. Government fleet (Hales et al. 2005).

Because bed-leveling has been a common and accepted dredging practice, contract language and dredging company daily operation logs typically have not documented specific dates and corresponding locations where this technique

was used (Hales et al. 2005). Although bed-leveling is known to have occurred in Canaveral Harbor, no records could be found to document the extent or locations of use since 1990. However, the Jacksonville District has recently written and used contract language to help clarify specifications and document bed-leveler use in that District. The most recent version of the *Jacksonville District Local Master Guide Specifications* contains language that requires the contractor to submit drawings and one photograph showing drag bar equipment used for final leveling work. In addition, the document states that bed-leveling by dragging the bottom with a drag bar or other apparatus shall be allowed only in the designated dredging areas shown on the drawings. Dragging in areas outside of the designated dredging areas shown on the drawings is specifically prohibited without written approval of the Contracting Officer. The contractor must fully document all bed-leveling activity including date and time for initiation and completion of bed-leveling. All bed-leveling activity must be documented on the Contractor's Quality Control Report (QCR).

CONCLUSIONS

Although there are concerns regarding bed-leveling and its potential to impact sea turtles, one argument has been made in support of bed-leveler use during the clean-up phase of projects using hopper dredges. It is thought that sea turtles may rest in trenches created by repetitive transits of the dragheads and become susceptible to entrainment when the dredge attempts to level the remaining high spots during the clean-up phase of the project (Hales et al. 2005). Therefore, the use of bed-levelers for clean-up operations is probably preferable to the use of hopper dredges since turtles which are foraging, resting, or brumating on irregular bottoms are probably more likely to be entrained by suction dragheads. The rationale is if bed-levelers are used during hopper dredging projects to minimize trench formation and perform clean-up operations, the actual duration of dredging can conceivably be shortened and the potential turtle take reduced (Hales et al. 2005). Furthermore, a bed-leveler that works more on the tops of the trenches with no hydraulic suction capabilities could potentially impact fewer sea turtles than a draghead with entraining flow fields exposed as it skips over bottom trenches (Hales et al. 2005).

Since bed-leveling is not a specific pay item, tugs and drag beams for bed-leveling have not previously been included in the plan and equipment lists of contractors' bids. Contract language and dredging company daily operation logs typically do not require specific dates and corresponding locations where this technique is used (Hales et al. 2005). The recent USACE ERDC survey confirmed that little or no information exists about the use of bed-leveling devices during dredging projects. USACE ERDC and SAD have proposed devising studies to evaluate the potential impacts of bed-levelers on sea turtles during cleanup dredging activities (Dickerson and Clausner 2003). The need to better describe the bed-leveling process, including gear types and ranges of applications, was identified as an initial step toward a balanced evaluation of this sediment management practice (Hales et al. 2005). In addition, USACE Jacksonville District has responded to the issue by including language in its dredging contracts to help clarify specifications and to document bed-leveler use in that District. Other USACE Districts are using this language as a potential model to help clarify contracts that involve the use of bed-levelers. This information will be helpful in fully assessing whether bed-leveling activities adversely affect sea turtle populations.

Corps Determination

Although NMFS has determined that bed-leveling is a cause of injury or lethal take to sea turtles (NMFS 2003a and 2003b), a review of the use of bed-leveling devices in Port Canaveral over the last 15 years does not support this belief. Port Canaveral and the Canaveral Harbor entrance channel are known to have high concentrations of sea turtles. Evidence of these concentrations was documented during the 2003 and 2004 relocation trawling events in support of emergency hopper dredging of the entrance channel, which relocated 69 turtles in three days and 124 turtles in 21 days of trawling. After reviewing numbers and locations of stranded turtles within a 6.4-km (4-mile) radius of the port's entrance channel, the dates strandings were recorded, and the types of injuries exhibited on the carcasses, the Corps cannot find a link between bed-leveling and crushing/impact injuries on stranded sea turtles, nor can the Corps find that a significant difference exists in stranding numbers and locations between dredging event time periods and non-dredging event time periods.

Based on a review of the information provided in the BAs, the Jacksonville District of the U.S. Army Corps of Engineers determined that the proposed use of bed-leveling devices in the four Florida ports may affect, but is not likely to adversely affect, listed marine turtle species within the action area and requests concurrence with this determination. The Corps submitted the four BAs to NMFS via letters dated March 21, 2006. NMFS reviewed the

BAs and in a letter dated June 23, 2006 determined that they believed that use of a bed-leveler was part of the larger dredging process and that the South Atlantic Division (SAD) (of which the Jacksonville District is a component) should re-initiate consultation under the ESA for dredging activities in the southeast US (from the North Carolina/Virginia state line south through and including Key West). Following receipt of this letter, and internal discussions within the SAD districts, SAD formally reinitiated consultation with NMFS via a letter dated April 30, 2007. This consultation remains in process.

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